

Activity 9

Making Decisions About Hazardous Waste Cleanup



Duration	3 1/4 class periods
Grade Level	9-12
Key Terms/ Concepts	Cleanup Hazardous waste Potentially Responsible Party Superfund
Suggested Subjects	Health Life Science Physical Science Social Studies Drama Civics/Government

Purpose

This activity lets students assume roles and act out a situation that illustrates the process of decision making related to cleaning up a Superfund site. Students identify the participants in the Superfund decision making process, make judgments about the potential effect of site cleanup on the characters they portray, and learn that different people have different perspectives on the same cleanup issues. In addition, they practice writing statements, formulating questions, and articulating their views in a public meeting setting.

Background

Whether we are children or adults, our lives are influenced by a constant series of choices. Some choices we make for ourselves. Some are made by parents for their children, and many are made by people we don't even know. The combination of all these choices determines the quality of each of our lives. Making these choices is not easy because sometimes what one person perceives as the right choice for him or her as an individual may be perceived as the wrong choice for the neighborhood, community, or country.

For example, people living near an abandoned **hazardous waste** site may want the site cleaned up as fast as possible, no matter what the cost, because they fear for their own, as well as their children's, safety. On the other hand, people employed by a company that caused the contamination at the site (a **Potentially Responsible Party**) or the local government may favor alternatives that, while effective, take longer and cost less. They are concerned about the impact on jobs and the local economy if the government requires the company to pay too much for the **cleanup**.



The process of making decisions about **Superfund** site cleanup involves weighing and balancing a variety of technical and nontechnical factors, including the sometimes competing interests in the community. This activity provides a lesson about Federal policy-making that extends well beyond the Superfund Program.

To help prepare your students for this activity, use *Warm-Up 5: Hazardous Waste Issues in the News*. You may perform the entire Warm-Up or simply review the main points covered in it. As a follow-up, have your students perform *Activity 11: What the Community Can Do*.

For additional information on these topics, see the Suggested Reading list found at the end of the Haz-Ed materials. Other Haz-Ed materials that are related to this topic include *Fact Flash 8: Common Cleanup Methods* and *Fact Flash 10: Superfund Community Involvement Program*.

Preparation

1. Gather the following materials:
 - Copies for each student of Student Handout, *Analysis of Alternatives for Cleaning Up Flowing Railroad Site*
 - The *Character Background Sheets* included at the end of this lesson
 - Copies for each student of:
 - Fact Flash 2: The Superfund Cleanup Program*
 - Fact Flash 4: Flowing Railroad Site Investigation Results*.

Procedure

Class #1

1. Explain to students that in two successive follow-up sessions the class will act out a situation that illustrates the sometimes difficult process of making decisions about Superfund site cleanup. For this role-playing exercise, students will assume they live in the hypothetical area of the Flowing Railroad Superfund site. They will participate in a community meeting held to discuss and air community views about the site cleanup options under consideration.
2. Divide the class into nine teams. Explain that each team will represent one of the “players” in this drama: the U.S. Environmental Protection Agency’s (EPA) **Remedial Project Manager (RPM)**, EPA’s **Community Involvement Coordinator (CIC)**, a local Health Department official, the Mayor of Ruralville, the attorney for



FRR Enterprises, a local environmental activist, a person employed at Flow Automations, Inc., a local farmer, and a local carpenter.

NOTE: If you live in a community near a real Superfund site, you may choose to prepare Student Handouts using information about that site so the role-play will be more realistic for your students. Call the Community Involvement Coordinator in your state. Phone numbers are provided at the end of the Haz-Ed materials.

3. Assign a role to each team and explain that later each team will have to choose 1 team member to be the actor when the first part of the drama is played out at the next class. Team members should prepare a written statement for their character to deliver, as well as a list of questions the character may want to ask at the meeting.
4. Distribute the Student Handout, *Analysis of Alternatives for Cleaning Up Flowing River Site*. Give each team the *Character Background Sheet* that is appropriate for its assigned role. *NOTE: If you live in a community near a Superfund site, you may choose to adjust the roles and the background information for each to approximate the makeup and situation in your community.*
5. Distribute Fact Flashes 2 and 4. Explain to students that these Fact Flashes can be used as background information.
6. Explain that the information on these handouts can be used to develop their character's beliefs, attitudes, and point of view about the cleanup. Stress that this should go beyond what the character knows or has heard and should include identifying questions the character wants to ask about the cleanup. Encourage students to talk to their parents, local city or town government officials, business owners, and others to help develop their perspectives. Also remind students that some of their characters—EPA's RPM and CIC, the Mayor, and the official from the local Health Department, and possibly others—would probably consult with each other in real life to prepare for the meeting. Encourage teams responsible for these characters to do so.
7. Specify a specific date for the next class, allowing several days for preparation.

Class #2

1. For the role-play activity, have the students representing the Mayor and the CIC arrange desks or a table at the front of the room with chairs to accommodate 4 people, the Mayor, EPA's CIC, RPM, and the moderator/facilitator. Place a lectern, desk, or small table somewhere else in the room from which the other characters will make their statements.



NOTE: You may wish to assume the role of moderator/facilitator yourself or you can select a student to do so. The moderator/facilitator's only responsibilities are to maintain order, see that everyone has an opportunity to speak, direct questions to the appropriate person to answer, and see that people speak in turn rather than all at once.

2. At the conclusion of the meeting, explain to the students that the teams playing EPA's RPM and CIC will get together and consider the information presented in this meeting, make a decision, and present a Proposed Cleanup Plan at the next class (specify the date, allowing sufficient time for the RPM team to meet and prepare a plan). Students from the other teams will have an opportunity to discuss the decision among themselves and comment on it.
3. Have the Mayor speak first to welcome people to the meeting, then EPA's CIC. After that, have others (the assigned characters) raise their hands to be recognized as they would in a real meeting and call on them in turn. After all participants have made their initial statements, the various characters may be recognized to ask follow-up questions or make additional observations as often as time permits.

Class #3

1. Have the spokesperson for the RPM team present the team's Proposed Cleanup Plan, including the rationale for choosing the selected remedy. Allow no more than 10 minutes for this presentation.
2. Give students about 10 minutes to discuss the decision with their team members. Offer the teams an opportunity to comment on the decision. Is the decision clear? Do they agree with it? Why or why not? Do they understand the RPM team's rationale in making the decision?
3. After teams have made comments from the perspective of their characters, invite the class as a whole to discuss the role-play and the decisionmaking process illustrated. What were the various points of view expressed in the meeting? Which were similar? Which were different (competing)? Which would you have expected to carry more weight? Why? Did those points of view appear to influence the final decision? How do you think the decision will affect the quality of life in the community? Now that the decision has been made, do you think all the characters in this drama will accept it? Why or why not? What options do they have if they do not accept it? (*NOTE: An Instructor Fact Sheet, Highlights about Roles, is included in this lesson to help you ensure that the perspectives of all characters in the role-play are covered during the discussion.*)



Extension (Optional)

- Have students bring in examples throughout the year, from newspaper or local television news, of real Superfund cleanup or hazardous waste prevention decisions made by your local government or a major local business. Set aside time periodically to discuss the choices involved in these decisions and their impact on the quality of life in the community. *Warm-Up 5: Hazardous Waste Issues in the News* contains sample articles of the type students may find.

Instructor Fact Sheet – Highlights about Roles

NOTE: You may need to begin the discussion by identifying 1 or 2 of the actors' perspectives; try to make sure that perspectives of all the characters are covered during this discussion, encouraging the participants to identify as many as possible. You may want to write students' responses on the blackboard, or on a flip chart if you have one, to illustrate the range of perspectives presented and reinforce the idea that the decisionmaking process involves weighing and balancing many different, and sometimes competing, points of view.

- The **RPM** wants to learn more about the citizens' concerns so s/he knows what they are and how they can be addressed by the cleanup of the site and reflected in various written reports and other methods (e.g., fact sheets).
- The **CIC** also wants to learn more about the community's concerns, so s/he can begin identifying the kinds of information the community is seeking and ways it can be provided to them.
- The **local health official** wants more information about potential health hazards the community will be exposed to; the health official also sees this as an opportunity to increase his/her standing in the community.
- The **Mayor** of Ruralville has multiple perspectives. The mayor is concerned about the health and safety of the citizens and wants answers to questions. The mayor is also concerned about Ruralville's economic growth; its ability to attract future business; the danger of losing a major employer if FRR Enterprises goes bankrupt as a result of paying for cleaning up the site; and his/ her own reelection.
- The **attorney** for FRR Enterprises wants to protect his/her client's interests. If FRR Enterprises is being damaged financially due to incorrect or overly cautious studies, or is being asked to conduct site activities that go beyond reasonable measures for cleaning up the site, the attorney wants to know this so s/he can take action on behalf of the company.



- The local **environmental activist** is genuinely concerned about improving the environment and asks some very informed and appropriate questions in search for more information.
- The **plant worker** is worried about job security, as well as his/her family's health and safety.
- The **farmer** depends on the water from the Flowing River to irrigate the farm. The publicity surrounding this situation has already caused customers to be alarmed. The farmer wants to know exactly how serious this situation really is and how s/he can protect his/her farmland and economic future.
- The **carpenter** is concerned that the needs of poor people in the community won't be considered as decisions about the site are being made.

Analysis of Alternatives for Cleaning Up Flowing River Site

Alternative	Brief Description	Advantages	Disadvantages
#1 Provide Security	<p>This alternative is used as a baseline against which to compare other alternatives. It allows for continuous monitoring of site conditions; action can be taken if conditions change. It includes fencing the contaminated area and erecting signs to indicate potential health hazards.</p>	<p>Because no threat to drinking water exists (the deep aquifer is not connected to the shallow aquifer), funds for this site may be used for more hazardous sites.</p> <p>The fence prevents direct contact with contamination.</p>	<p>It does not address the contamination.</p> <p>Contaminated water may continue to move toward the Flowing River.</p> <p>Asbestos particles may be released during windy weather if erosion continues to occur.</p> <p>The site is not available for future use.</p>
#2 Only Cap	<p>This alternative places layers of waterproof material like clay and plastic over the contamination. It reduces the amount of water reaching the contamination, and the contamination is slowed from moving and reaching water sources.</p>	<p>A short period of construction is required, so the site is addressed quickly.</p> <p>This technology is inexpensive, reliable, and commonly used. It will last with proper maintenance.</p> <p>The cap will reduce the rate at which the contamination in the shallow aquifer will move toward the Flowing River.</p>	<p>The cap does not neutralize or eliminate contamination.</p> <p>The cap requires maintenance and monitoring and is not always 100% effective.</p> <p>It limits the site's reuse; in order to maintain the cap, nothing can be built on top of it.</p>
#3 Cap, Air Stripping, Chemical Precipitation	<p>This alternative uses a cap to address soil contamination, as described in Alternative #2.</p> <p>Air stripping and chemical precipitation of contaminated water requires building a large tower on the site and drilling wells into the aquifer. Contaminated water is pumped to the top of the tower where the volatile pollutants can evaporate and form a gas. The gas is then filtered through a layer of carbon to remove the contaminants.</p> <p>After air stripping, the water is treated by chemical precipitation to remove the heavy metals. Chemicals are added to the water to create a sludge. The water is filtered from the sludge, treated, and pumped back into the environment. The sludge is sent off site to a licensed disposal facility.</p>	<p>The cap addresses the asbestos. See discussion of capping advantages in Alternative #2.</p> <p>This technology effectively removes most of the contamination from the shallow aquifer over 2-10 years.</p> <p>Most of the contamination is addressed through treatment, without having to move it from the site.</p> <p>An air stripper is relatively easy to operate and is not technically complex.</p> <p>Metals and PCBs are captured in the sludge. A licensed off-site facility can contain the sludge through extensive controls.</p>	<p>See the discussion of capping disadvantages in Alternative #2.</p> <p>The air stripping tower needs to be monitored carefully to ensure that any contamination released into the air meets State standards.</p> <p>Air stripping is 90% efficient and the tower needs to be monitored to prevent releases of contaminants.</p> <p>Contaminated sludge needs to be disposed of properly offsite.</p>

Analysis of Alternatives for Cleaning Up Flowing River Site (con't.)

Alternative	Brief Description	Advantages	Disadvantages
#4 Incineration, Air Stripping, and Chemical Precipitation	<p>This alternative involves digging up and burning contaminated soils at high temperatures in an on-site incinerator. The incinerator destroys TCE and PCB contamination. The remaining ash containing heavy metals is shipped off site to a landfill.</p> <p>As described in Alternative #3, air stripping and chemical precipitation of contaminated water require building a large tower on the site and digging wells into the aquifer. Contaminated water is pumped to the top of the tower where some of the pollutants can form a gas that may be filtered through carbon. Heavy metals are removed from the water by chemical precipitation.</p>	<p>The site is "clean" and available for reuse.</p> <p>The incinerator destroys at least 99.9999% of the organic (burnable) contaminants in the soil.</p> <p>An air stripper is relatively easy to operate.</p>	<p>Stringent permits are required to operate an incinerator. Hazardous emissions from incinerators have been associated with health risks, so careful monitoring is required.</p> <p>Public resistance to incineration often occurs. Treatment residuals from the incinerator must be managed and disposed of.</p> <p>Air stripping is 90% efficient. The air stripping tower needs to be monitored carefully to ensure that any contamination released into the air meets State standards.</p> <p>Asbestos is not addressed.</p>
#5 Complete Excavation	<p>This alternative requires digging up a large volume of the contaminated soil and shipping it to an off-site hazardous waste facility.</p> <p>Groundwater contamination is treated on site with air stripping and chemical precipitation, as described in Alternative #3.</p>	<p>This technology removes contaminated soil completely in a short period of time and requires no future maintenance.</p> <p>An air stripper is relatively easy to operate and is not technically complex.</p> <p>The site is safe for future use.</p>	<p>Trucks that carry contaminated soil (and those that deliver clean backfill) drive through town. A risk that something could go wrong during the removal and export of soil exists, which could result in public exposure to the contaminants through the air.</p> <p>Concerns may be raised over odor caused by excavation and transporting contaminated soil.</p> <p>Contamination is not addressed or treated on-site, but is passed elsewhere.</p> <p>Dust from excavation activities must be controlled.</p> <p>Roads may need to be repaired.</p>



Character Background Sheet

EPA Remedial Project Manager (RPM)

You are the RPM assigned to the Flowing Railroad site. Your job is to direct the response effort and coordinate all cleanup activities at the site. You are responsible for coordinating not only with EPA Regional and Headquarters staff, but also with other Federal, state, and local agencies.

Although you live and work in the city where the EPA Regional Office is located, many of the sites for which you have been responsible were in small towns and rural areas like this one, so you can empathize with the concerns of the citizens of Ruralville. Your purpose at the community meeting is to tell people about the investigation of the problems at the site and the sort of cleanup options you are weighing as a result. In addition, you want to give them the opportunity to ask any questions and express any concerns they have about the cleanup in general or about specific cleanup options.

When the meeting is over, you will have to make a final decision about how to recommend that the site be cleaned up, balancing the data from your investigation and the other information at your disposal with what you hear in the meeting about what the community thinks. This is not an easy decision to make, because there are a lot of needs and interests you must try to satisfy—the requirements in the law, the needs of the people who live in the community, the wishes of those who run businesses in the community, the interests of FRR Enterprises which is a major employer in the community, etc.

You are responsible for choosing a cleanup option that:

1. protects human health and the environment
2. complies with existing Federal and state laws and requirements

Your choice also must:

1. be effective in the short-term, as well as over the long-term
2. reduce the toxicity, mobility, or volume of the contaminants
3. be realistic
4. be reasonably cost-effective
5. be acceptable to the community

You will prepare a Proposed Cleanup Plan describing your decision and discussing why you chose to proceed in this way. You will have to present that plan to the same group of people from the community and hear their reactions.



Character Background Sheet

EPA Community Involvement Coordinator (CIC)

You are the CIC assigned to the Flowing Railroad site. Your job is to manage all EPA's community involvement activities to provide an opportunity for public participation in the Superfund process.

You grew up in Ruralville but left to go to college. Now you live in the city where EPA's Regional Office is located. You still know a lot of people in Ruralville, and you are eager to help them understand what's involved in cleaning up the site and how the cleanup will—and will not—affect their lives.

Your purpose at the community meeting is to help explain the cleanup options being considered, answer citizens' questions, and listen to community concerns. You have already met most of the people at the meeting because your overall responsibility has been to ensure that the community knows what to expect and how to participate in Superfund decisionmaking. You have been sharing information about the Superfund process with the community and obtaining information from them since EPA's activities at the site began. You've visited with individuals, families, and business owners in the community, written fact sheets about various stages in the process, gathered and distributed information about the site itself and the data EPA collected during its investigation of the site. When the meeting is over and the RPM has made a final decision about how to clean up the site, you will prepare a fact sheet that summarizes the decision and help the RPM respond to comments from the community about the selected cleanup strategy.

You lead the meeting for EPA.



Character Background Sheet

Local Health Official

You are a Health Advisor for the Ruralville Health Department. Although you have more than 10 years of experience in the health field, this is the first time you have encountered a situation involving a hazardous waste site.

Your purpose at the community meeting is to learn as much as possible about any potential health effects that could result, now or in the future, from contamination at the site and from efforts to clean it up. You need this information to be able to accurately advise townspeople of any health-related dangers and how to avoid them.



Character Background Sheet

Mayor of Ruralville

You have been Mayor of Ruralville for six years. Your job is to protect the health and welfare of the community and its citizens and to make sure the interests of the community are considered as Superfund decisions are made.

You are a well-respected member of the community. Most of the townspeople believe you have done good things for Ruralville. Your purpose at the meeting is to demonstrate the leadership residents expect from their Mayor and to ensure the continuing economic well-being of the community, as well as the safety of its citizens.

You support town growth and have helped several small businesses get established in the community. Some people credit you with being instrumental in Flowing Railroad's decision to open its Flow Automations factory in Ruralville. The factory employs many of the people who work in Ruralville. In fact, some of them originally worked for the Flowing Railroad and were retrained so they could work at the new factory.

Your family is very important to you. You are especially close to your oldest child who happens to be married to the president of Flow Automations.

You lead the meeting.



Character Background Sheet

Attorney for FRR Enterprises

You are the general counsel for FRR Enterprises which owns the Flowing Railroad Company site and Flow Automations. Your purpose at the meeting is to protect the company's interests. You want to make sure the government and individual residents realize how the cleanup decisions in this case will affect the company and, in turn, the town's tax revenue and all the townspeople employed by the company.

You are concerned because FRR Enterprises already has spent more than \$1 million on studies required to determine the extent of contamination at the site, and more bills are on the way. FRR Enterprises also will have to bear much of the cost of any cleanup remedy selected. You want people to understand that the contamination at the site resulted from activities that were legal at the time. You intend to argue that to make the company bear the financial burden for that is unfair, because the company did not do anything wrong. Besides, the Flowing Railroad was not the only business operated on the site, and if FRR Enterprises has to pay, even though they did nothing wrong, so should all the other businesses who operated on the site. FRR should not be penalized just because it is still around.

Although FRR Enterprises is financially stable now, company officials—your bosses—are concerned about the long-term impact of the cleanup since it is hard to predict what the total cost will be.



Character Background Sheet

Local Environmental Activist

You are a resident of Ruralville and the founder of the local chapter of Everlasting Earth. Everlasting Earth is a national advocacy organization dedicated to preventing pollution and fighting threats to public health and the environment. You are passionate in your belief that polluters should pay to clean up the problems they create.

Your purpose at the meeting is to make sure that no one lets FRR Enterprises off the hook. You believe they have damaged the environment and, as a result, the health of community residents could be in danger. You were one of the first people to learn (from your friend at the bank) about the environmental audit of the Flowing Railroad site. As soon as you heard the consulting firm's findings, you began lobbying to get the town to demand the site be cleaned up; you want the most stringent cleanup standards applied in this case.

You do not believe the town should be concerned with how much the cleanup might cost; FRR Enterprises must be made to pay, no matter what the cost. You also do not believe there is any danger that FRR Enterprises could go bankrupt or that Flow Automations could go out of business as a result of paying for the cleanup. You think the company is just trying to scare people.



Character Background Sheet

Worker at the Flow Automations Factory

You are employed as an assembler at the Flow Automations factory. Prior to this job, you worked for the Flowing Railroad.

Your purpose at the meeting is to learn as much as you can about the problems at the site and the cleanup being proposed. You feel like you are being asked to choose a “side” on this issue but you are confused. You have a number of concerns about the situation but no one answer seems to satisfy them.

You are a single parent with three young children. On the one hand, you need your job at Flow Automations; you have no other source of income. Besides that, Flowing Railroad was good to you; the company got you the job at Flow Automations and paid for the training you needed to do it. On the other hand, you and your children live near the site and you have the children’s health and well-being to consider.



Character Background Sheet

Owner of a Farm near the Flowing River

You own 75 acres of farmland, some of which borders the Flowing River. The farm has been in your family for generations.

Your purpose at the meeting is to get some straight answers about the contamination from the site and how far it has spread. You want to know if it is affecting your crops and what can be done to stop it. You grow several crops and sell them to supermarkets in Ruralville and in several towns throughout the state. You depend on sales to stay in business and to pay your employees.

Your farm has had a number of hardships over the years. First, you lost many of your crops to a severe drought 2 years ago. Then, an electrical storm last June started a fire that burned several acres before it could be stopped. These things have cost you a lot of money. Now, some of your customers are asking you if your crops are contaminated because of what's happened at the Flowing Railroad site.

You feel like your farm's reputation and your whole future is at stake. You intend to let the Mayor and the people from the government know that and demand that they do whatever is necessary to solve the problem.



Character Background Sheet

Local Carpenter

You, your spouse, and your 4 children have lived in a rented cottage on the banks of the Flowing River for about a year. The Long Shot Cafe, where your spouse worked as a bartender, closed several months ago. Your spouse has not been able to find another job, so you have been the sole supporter for the family.

You earn money by doing odd jobs around town, but there haven't been many lately. You've had to depend on fishing in the river to feed your family; 3 of 4 main meals a week over the last few months have come from the river.

You have become increasingly frightened and angry over the last few weeks as you have heard more and more rumors about possible contamination of the river. You are convinced that, because you and your family are poor, your welfare will not be considered as the government makes decisions about how to deal with the Flowing Railroad site.

Your purpose at the meeting is to make them listen to your concerns.

